

Control Engineering INDEX*

VOLUME 11... JANUARY-DECEMBER 1964

(WN) What's New
(IP) Industry's Pulse

* Unless otherwise designated, items are feature articles or Ideas at Work.

A

Accelerometers

- Balanced beam improves angular accelerometer. Phillips & Roberson... July 91

Actuators

- Designer's Workbook. G. J. Ganczarski 2. Putting dc torque motors to work Nov. 75
The harmonic drive electromechanical actuator. Vincent O'Gorman... Dec. 69
Static ac adjustable frequency drives. K. A. Hultstrand Apr. 57
Two-in-one drive creeps smoothly. G. W. Heumann July 93

Adaptive control

- Bionics: control engineering comes to life. R. L. Aronson Nov. 95
A milestone in adaptive machine control. Centner & Idelsohn Nov. 92
Sensors will optimize metal cutting, experimenters hope (WN) ... Aug. 19

Air traffic control

- National airspace system takes shape (WN) Jan. 23
Remote control networks keep pilots in touch. R. J. Glischinski... Mar. 115

Aircraft

- The dynamically tuned free rotor gyro. Howe & Savet June 67
Fluid amplifiers—vortex senses aircraft pitch rate. J. H. Lindahl... Sept. 99
Hand control signals six degrees of freedom. R. M. Johnson... Sept. 121
Inertial navigation goes commercial (WN) Aug. 26
New controls, new cooperation at British Air Show (WN) Oct. 35
Oleo transducers compute plane's weight. B. J. Hawkins Dec. 99

Analog-to-digital conversion

- Differential encoder tells position and direction. D. H. Hartke Mar. 119

Analysis instruments

- CRT displays metals' defects. Albert Kovacs Aug. 95
Checklist for analyzer sampling systems. American Petroleum Institute Dec. 59
How papermakers measure moisture. E. F. Thode Nov. 67
Makers and users joust over analytical instruments (WN) July 23
Microwaves analyze gas composition. G. Johansson Apr. 101
Multistream distillation monitors. W. H. Topham Apr. 65
Stream analyzer senses crystallization point Sept. 119

Automatic warehousing

- Warehouse computer links order picking with invoicing. Philips & Rowland Mar. 101

B

Boiler control

- Computer will even ore mix (WN) Sept. 32
Fluid amplifiers—pure fluid controls

- for ship's boiler. Dexter & Colston Sept. 96
Putting analog control computers to work. F. M. Ryan Aug. 53
Startup at Riverside. E. J. Kompass Jan. 69

C

Character reading (see Information systems)

Circuits

- Choppers compensate ac servos. E. R. Schlesinger Sept. 113
Counting pulses on parallel channels. R. G. Farnsworth July 65
Fluid amplifiers—capabilities and applications. Gray & Stern Feb. 57
How to design low-cost digital controls. R. M. Centner Feb. 75
How to use silicon controlled rectifiers in series or parallel. A. R. Mulica May 95
How to use turbulence amplifiers for control logic. R. N. Auger June 89
Intrinsic safety. F. M. Ryan June 73
Perspective on fluid amplifiers—Practical control system components. E. J. Kompass Sept. 82
Connecting elements into circuits and systems. Shinn & Boothe Sept. 86
Truth table logic speeds BCD-binary conversions. David Cohen Mar. 78
Try permutation codes. F. H. Fowler Jr. Jan. 75
Zero-crossing detector suppresses transients. Nairn & Thalimer Oct. 129

Coding

- The coordinate concept: an approach to tape punching. D. B. Holland & others Aug. 60
Gallium phosphide lamps code digits on film. M. C. Roland June 113
Truth table logic speeds BCD-binary conversions. David Cohen Mar. 78
Try permutation codes. F. H. Fowler Jr. Jan. 75

Company profiles

- Louis Allis Co. emerges as a drive systems maker Dec. 32
Barnes Engineering Co. diversifies into instruments (WN) Feb. 31
CompuDyne Corp. seeks stability through products (WN) Mar. 39
Control Data Corp. breaks the \$100 million barrier (WN) Nov. 34
Corning Glass Works applies materials to products (WN) Jan. 32
Data Communications, Inc. seeks leverage for growth (WN) May 28
Ferranti Ltd. bridges NC user gap (WN) Apr. 32
Fischer & Porter thrives on problem-solving (WN) Oct. 39
Industrial Nucleonics sells results to industry (WN) June 32
UGC Instruments, Inc. seeks to bridge the 'data gap' (WN) Sept. 175

Compensation

- Choppers compensate ac servos. E. R. Schlesinger Sept. 113
Designer's Workbook

1. Selecting ac servomotor compensation. A. F. Clarke Jr. Oct. 99
2. Putting dc torque motors to work. G. J. Ganczarski Nov. 75
Designing servocompensators graphically. L. Q. Pena Jan. 79

Components

- Bidirectional static switch simplifies ac control. M. P. Southworth Mar. 75
Designer's guide to solid state photo-sensors. J. R. McDermott Oct. 71
The dynamically tuned free rotor gyro. Howe & Savet June 67
The electric vacuum gyro—pinpoint for Polaris launching. H. W. Knoebel Feb. 70
Finding synchro position from voltages. B. H. Robinson Oct. 107
Fluid amplifiers—Capabilities and applications. Gray & Stern Feb. 57
The harmonic drive electromechanical actuator. Vincent O'Gorman... Dec. 69
Perspective on fluid amplifiers—report E. J. Kompass Sept. 73
The development of basic devices and the need for theory. Fox & Wood Sept. 75
Practical control system components. E. J. Kompass Sept. 82
Connecting elements into circuits and systems. Shinn & Boothe Sept. 86
Applications in control systems: Diverting valves cool burners. Mam-zic & Johnson Sept. 94
Pure fluid controls for ship's boiler. Dexter & Colston Sept. 96
Fluid logic fills bottles fast. R. N. Auger Sept. 98
Vortex senses aircraft pitch rate. J. H. Lindahl Sept. 99
17 ways to stop control accidents. Seminara & Parsons Nov. 84
The threshold switch: new component for ac control. M. P. Southworth Apr. 69

Composition measuring (see Analysis Instruments)

Computer equipment comparisons

- Computer equipment comparison series 16. Card, punched tape, and printing devices for 16 new computers Mar. 103
17. Magnetic tape and random access devices for 16 more medium to large computers May 115
18. Processors and combined function times for 16 more medium to large computers July 77

Computer input devices

- Character readers for mail sorting pushed by Post Office (WN) .. Feb. 19
Computer equipment comparison series 16. Card, punched tape, and printing devices for 16 new computers Mar. 103
Linking on-line data acquisition to general purpose computers. Mitchell Bain Apr. 92
Pins and loops read out miner deployment data. A. J. Spencer May 123
21 ways to pick data off moving objects. R. J. Barber Part II Jan. 61

Control Engineering INDEX*

VOLUME 11... JANUARY-DECEMBER 1964

(WN) What's New
(IP) Industry's Pulse

* Unless otherwise designated, items are feature articles or Ideas at Work.

A

Accelerometers

- Balanced beam improves angular accelerometer. Phillips & Roberson... July 91

Actuators

- Designer's Workbook. G. J. Ganczarski 2. Putting dc torque motors to work Nov. 75
The harmonic drive electromechanical actuator. Vincent O'Gorman... Dec. 69
Static ac adjustable frequency drives. K. A. Hultstrand Apr. 57
Two-in-one drive creeps smoothly. G. W. Heumann July 93

Adaptive control

- Bionics: control engineering comes to life. R. L. Aronson Nov. 95
A milestone in adaptive machine control. Centner & Idelsohn Nov. 92
Sensors will optimize metal cutting, experimenters hope (WN) ... Aug. 19

Air traffic control

- National airspace system takes shape (WN) Jan. 23
Remote control networks keep pilots in touch. R. J. Glischinski... Mar. 115

Aircraft

- The dynamically tuned free rotor gyro. Howe & Savet June 67
Fluid amplifiers—vortex senses aircraft pitch rate. J. H. Lindahl... Sept. 99
Hand control signals six degrees of freedom. R. M. Johnson... Sept. 121
Inertial navigation goes commercial (WN) Aug. 26
New controls, new cooperation at British Air Show (WN) Oct. 35
Oleo transducers compute plane's weight. B. J. Hawkins Dec. 99

Analog-to-digital conversion

- Differential encoder tells position and direction. D. H. Hartke Mar. 119

Analysis instruments

- CRT displays metals' defects. Albert Kovacs Aug. 95
Checklist for analyzer sampling systems. American Petroleum Institute Dec. 59
How papermakers measure moisture. E. F. Thode Nov. 67
Makers and users joust over analytical instruments (WN) July 23
Microwaves analyze gas composition. G. Johansson Apr. 101
Multistream distillation monitors. W. H. Topham Apr. 65
Stream analyzer senses crystallization point Sept. 119

Automatic warehousing

- Warehouse computer links order picking with invoicing. Philips & Rowland Mar. 101

B

Boiler control

- Computer will even ore mix (WN) Sept. 32
Fluid amplifiers—pure fluid controls

- for ship's boiler. Dexter & Colston Sept. 96
Putting analog control computers to work. F. M. Ryan Aug. 53
Startup at Riverside. E. J. Kompass Jan. 69

C

Character reading (see Information systems)

Circuits

- Choppers compensate ac servos. E. R. Schlesinger Sept. 113
Counting pulses on parallel channels. R. G. Farnsworth July 65
Fluid amplifiers—capabilities and applications. Gray & Stern Feb. 57
How to design low-cost digital controls. R. M. Centner Feb. 75
How to use silicon controlled rectifiers in series or parallel. A. R. Mulica May 95
How to use turbulence amplifiers for control logic. R. N. Auger June 89
Intrinsic safety. F. M. Ryan June 73
Perspective on fluid amplifiers—Practical control system components. E. J. Kompass Sept. 82
Connecting elements into circuits and systems. Shinn & Boothe Sept. 86
Truth table logic speeds BCD-binary conversions. David Cohen Mar. 78
Try permutation codes. F. H. Fowler Jr. Jan. 75
Zero-crossing detector suppresses transients. Nairn & Thalimer Oct. 129

Coding

- The coordinate concept: an approach to tape punching. D. B. Holland & others Aug. 60
Gallium phosphide lamps code digits on film. M. C. Roland June 113
Truth table logic speeds BCD-binary conversions. David Cohen Mar. 78
Try permutation codes. F. H. Fowler Jr. Jan. 75

Company profiles

- Louis Allis Co. emerges as a drive systems maker Dec. 32
Barnes Engineering Co. diversifies into instruments (WN) Feb. 31
CompuDyne Corp. seeks stability through products (WN) Mar. 39
Control Data Corp. breaks the \$100 million barrier (WN) Nov. 34
Corning Glass Works applies materials to products (WN) Jan. 32
Data Communications, Inc. seeks leverage for growth (WN) May 28
Ferranti Ltd. bridges NC user gap (WN) Apr. 32
Fischer & Porter thrives on problem-solving (WN) Oct. 39
Industrial Nucleonics sells results to industry (WN) June 32
UGC Instruments, Inc. seeks to bridge the 'data gap' (WN) Sept. 175

Compensation

- Choppers compensate ac servos. E. R. Schlesinger Sept. 113
Designer's Workbook

1. Selecting ac servomotor compensation. A. F. Clarke Jr. Oct. 99
2. Putting dc torque motors to work. G. J. Ganczarski Nov. 75
Designing servocompensators graphically. L. Q. Pena Jan. 79

Components

- Bidirectional static switch simplifies ac control. M. P. Southworth Mar. 75
Designer's guide to solid state photo-sensors. J. R. McDermott Oct. 71
The dynamically tuned free rotor gyro. Howe & Savet June 67
The electric vacuum gyro—pinpoint for Polaris launching. H. W. Knoebel Feb. 70
Finding synchro position from voltages. B. H. Robinson Oct. 107
Fluid amplifiers—Capabilities and applications. Gray & Stern Feb. 57
The harmonic drive electromechanical actuator. Vincent O'Gorman... Dec. 69
Perspective on fluid amplifiers—report E. J. Kompass Sept. 73
The development of basic devices and the need for theory. Fox & Wood Sept. 75
Practical control system components. E. J. Kompass Sept. 82
Connecting elements into circuits and systems. Shinn & Boothe Sept. 86
Applications in control systems: Diverting valves cool burners. Mam-zic & Johnson Sept. 94
Pure fluid controls for ship's boiler. Dexter & Colston Sept. 96
Fluid logic fills bottles fast. R. N. Auger Sept. 98
Vortex senses aircraft pitch rate. J. H. Lindahl Sept. 99
17 ways to stop control accidents. Seminara & Parsons Nov. 84
The threshold switch: new component for ac control. M. P. Southworth Apr. 69

Composition measuring (see Analysis Instruments)

Computer equipment comparisons

- Computer equipment comparison series 16. Card, punched tape, and printing devices for 16 new computers Mar. 103
17. Magnetic tape and random access devices for 16 more medium to large computers May 115
18. Processors and combined function times for 16 more medium to large computers July 77

Computer input devices

- Character readers for mail sorting pushed by Post Office (WN) .. Feb. 19
Computer equipment comparison series 16. Card, punched tape, and printing devices for 16 new computers Mar. 103
Linking on-line data acquisition to general purpose computers. Mitchell Bain Apr. 92
Pins and loops read out miner deployment data. A. J. Spencer May 123
21 ways to pick data off moving objects. R. J. Barber Part II Jan. 61

Computer programming

- Converting process equations for analog computer control. George Platt. Feb. 65
Expanding internal memory in a real-time system. R. B. Scott. Oct. 118
Inverse table lookup for ordinal transformations. F. H. Fowler Jr. Nov. 101
Programming languages ease digital simulation. D. E. Freeman. Nov. 103
Try signal flow graphs for analog programming. S. M. Becker. Sept. 109

Computers (see also Information systems)

Analog

- Converting process equations for analog computer control. George Platt. Feb. 65
Feedforward analog computer control of a superfractionator. MacMullan & Shinsky. Mar. 69
FJCC: control needs affect computer designs (WN). Dec. 24
Fluid amplifiers—practical control system components. E. J. Kompass. Sept. 82
Operators run simulated refinery for pre-startup experience. R. E. Lieber. Sept. 105
Putting analog control computers to work. F. M. Ryan. Aug. 53
Try signal flow graphs for analog programming. S. M. Becker. Sept. 109

Digital

- Computer equipment comparison series
16. Card, punched tape, and printing devices for 16 new computers. Mar. 103
17. Magnetic tape and random access devices for 16 more medium to large computers. May 115
18. Processors and combined function times for 16 more medium to large computers. July 77
Expanding internal memory in a real-time system. R. B. Scott. Oct. 118
FJCC: control needs affect computer designs (WN). Dec. 24
FJCC report: eight new computers bow (WN). Jan. 26
Fluid amplifiers—practical control system components. E. J. Kompass. Sept. 82
IFAC process computer talks take DDC in stride (WN). Dec. 21
Linking on-line data acquisition to general purpose computers. Mitchell Bain. Apr. 92
Programming languages ease digital simulation. D. E. Freeman. Nov. 103
7 configurations for real-time computer systems. R. V. Head. June 104
Startup at Riverside. E. J. Kompass. Jan. 69

Special purpose

- Oleo transducers compute plane's weight. B. J. Hawkins. Dec. 99
Phillips tries DDA computer for distillation columns control. M. L. Johnson & others. Aug. 68
Simple computer and crt display expedite typesetting. G. Y. Chu. Apr. 97
Simple computer cuts billets five ways. J. P. Clyne. Feb. 81
Special jig computes areas. H. E. Hotoko. Aug. 97
Warehouse computer links order picking with invoicing. Philips & Rowland. Mar. 101

Computing control

- Control computers boom in Britain (WN). June 30
Do control computers look good on paper? (WN). May 18
Feedforward analog computer control of a superfractionator. MacMullan &

- Shinsky. Mar. 69
4 views of train control—San Francisco tries them all. B. M. Blake. Dec. 62
IFAC process computer talks take DDC in stride. Dec. 21
Japanese computers make steel (WN). Mar. 26
Multiple computer system controls manufacturing line. E. E. Sarafin. Dec. 83
Papermill computer keeps the books. F. M. Ryan. Oct. 110
Phillips tries DDA computer for distillation columns control. M. L. Johnson & others. Aug. 68
Sampling controllers pace Japanese sintering mill. Kazuto Togino. May 86
Simple computer cuts billets five ways. J. P. Clyne. Feb. 81
Startup at Riverside. E. J. Kompass. Jan. 69
Steel controls emerge. (WN). Feb. 23
10 ways to find the optimum. J. M. Idelsohn. June 97
Testing toward the moon. E. J. Kompass. Apr. 74
Zeroing in on direct digital control. H. R. Karp. May 105

Controllers

- Compensating for dynamics in digital control. J. B. Slaughter. May 109
Controller settings and loop performance. P. S. Buckley. Aug. 81
Cutting controller costs. Ida & St. Clair. Oct. 86
Fluid amplifiers—fluid logic fills bottles fast. R. N. Auger. Sept. 98
How to design low-cost digital controls. R. M. Centner. Feb. 75
How to use turbulence amplifiers for control logic. R. N. Auger. June 89
Instrument sales to Europe soar (IP). Mar. 63
Intrinsic safety. F. M. Ryan. June 73
Multiple thermistors monitor car comfort. Nicholas Hunter. May 125
Sampling controllers pace Japanese sintering mill. Kazuto Togino. May 86
Static ac adjustable frequency drives. K. A. Hultstrand. Apr. 57

Counting

- Counting pulses on parallel channels. R. G. Farnsworth. July 65

D

Data collection (see also Information systems)

- Linking on-line data acquisition to general purpose computers. Mitchell Bain. Apr. 92
Multiple computer system controls manufacturing line. E. E. Sarafin. Dec. 83
National airspace system takes shape (WN). Jan. 23
Optical comb filters classify vehicles. J. E. Zupanick. Dec. 77
Portable tape recorder speeds data gathering. Will Rogers. Feb. 104
Testing toward the moon. E. J. Kompass. Apr. 74
Transaction-oriented information handling systems. D. B. Thompson
I. Information flow in the industrial enterprise. Jan. 87
II. Interfaces between work activities and the system. Feb. 91
III. Information storage. July 73
21 ways to pick data off moving objects. R. J. Barber Part II. Jan. 61
Warehouse computer links order picking with invoicing. Philips & Rowland. Mar. 101
Weather forecast: sensors will take climate data (WN). Sept. 19

Data Files (Reference sheets)

78. Designing servocompensators graphically. L. Q. Pena. Jan. 79
79. Sources of errors in ac servos. J. B. Heaviside. Feb. 85
80. Finding error coefficients from poles and zeros. T. J. Kobylarz. Mar. 89
81. Computing time response of a deadtime process. Mack Tyner. Apr. 79
82. Finding quintic-equation roots. C. R. Seliger. May 107
83. Transfer functions from frequency response. N. G. Meadows. June 95
84. Converting speed-torque curves graphically. J. Miro. July 69
85. Controller settings and loop performance. P. S. Buckley. Aug. 81
86. Try signal flow graphs for analog programming. S. M. Becker. Sept. 109
87. Finding synchro position from voltages. B. H. Robinson. Oct. 107
88. Inverse table lookup for ordinal transformations. F. H. Fowler Jr. Nov. 101
89. Find phase shift rapidly. H. J. Szot. Dec. 73

Data processing (see also Information systems)

- Expanding internal memory in a real-time system. R. B. Scott. Oct. 118
Gemini data: all channels lead to Houston (WN). July 21
Multiple computer system controls manufacturing line. E. E. Sarafin. Dec. 83
7 configurations for real-time computer systems. R. V. Head. June 104
Transaction-oriented information handling systems. D. B. Thompson
I. Information flow in the industrial enterprise. Jan. 87
III. Information storage. July 73
IV. Processing. Aug. 89

Data reduction

- Multiple computer system controls manufacturing line. E. E. Sarafin. Dec. 83
Testing toward the moon. E. J. Kompass. Apr. 74

Data transmission (see also Information systems)

- Data communications: computer men see boom ahead (IP). Jan. 51
Daily life at a data center (WN). Apr. 20
Gemini data: all channels lead to Houston (WN). July 21
How to price communications circuits. J. F. Holmes. Aug. 84
Remote control networks keep pilots in touch. R. J. Glischinski. Mar. 115
Time division multiplexing simplifies voice-reply switching. H. A. Kampf. Jan. 101
Weather forecast: sensors will take climate data (WN). Sept. 19

Detection

- Accurate resetting of dry reed proximity switch. G. W. Heumann. Feb. 104
Check unit synchronizes alternators. D. C. Gilchrist. Oct. 130
Eddy currents sort steel bars. T. W. Judd. Nov. 111
Help for the stranded motorist. Bacon & Cosgriff. Apr. 99
Optical comb filters classify vehicles. J. E. Zupanick. Dec. 97
Optical filters sort fresh produce. Virgil Harris. June 114
Thermistor bridge reveals defective vacuum bottles. Schumann & Ross. Feb. 103

Digital techniques (see also Information systems)

- Compensating for dynamics in digital

control. J. B. Slaughter.....	May	109
Counting pulses on parallel channels. R. G. Farnsworth.....	July	65
Gallium phosphide lamps code digits on film. M. C. Roland.....	June	113
How to design low-cost digital controls. R. M. Centner.....	Feb.	75
Pins and loops read out miner deployment data. A. J. Spencer.....	May	123
Programmed forging press features thickness controller. Charles Finkl.....	Feb.	101
Simple computer and crt display expedite typesetting. G. Y. Chu.....	Apr.	97
Digital-to-analog conversion		
Finding synchro position from voltages. B. H. Robinson.....	Oct.	107
Direct digital control		
DDC in London (WN).....	July	28
Direct digital control continues to pulse (WN).....	Apr.	25
Direct digital control gets user go-ahead (WN).....	June	23
ISA Show 1964: much DDC talk, little new hardware (WN).....	Nov.	22
Zeroing in on direct digital control. H. R. Karp.....	May	105

Display of data (see also Information systems)		
Drum and scope unit plots plant variables. John Werne.....	Nov.	109
Gallium phosphide lamps code digits on film. M. C. Roland.....	June	113
Mechanized contour display helps lay ocean pipeline. R. M. Gitlin.....	May	125
Testing toward the moon. E. J. Kompass.....	Apr.	74

E

Editorials		
Boy, is that grass green!.....	May	74
Can We Fix It?.....	Dec.	49
Control gap: is it a vector? (guest editorial by H. Chestnut).....	Feb.	53
Educate, demonstrate—convince.....	Sept.	71
Instant control engineering.....	Nov.	65
Second gap—worse than first?.....	June	65
Take those blinders off.....	Jan.	55
They're not unique any more.....	Oct.	67
We're poor salesmen.....	Aug.	49
We need proof of worth.....	Mar.	67
Who buys control systems?.....	Apr.	55
Why don't we get together?.....	July	47

Electronics

Designer's guide to solid state photo-sensors. J. R. McDermott.....	Oct.	71
Emergency power supplies. M. F. Brown.....	Jan.	65
5 uses for Hall transducers. G. W. Heumann.....		
1. Digital speed sensor.....	Jan.	57
2. Automatic conveyor dispatching.....	Jan.	58
3. Motor air-gap flux control.....	Jan.	59
4. Elevator leveling control.....	Jan.	59
5. Pneumatic-tube conveyor control.....	Jan.	60
How to use silicon controlled rectifiers in series or parallel. A. R. Mulica.....	May	95
The threshold switch: new component for ac control. M. P. Southworth.....	Apr.	69
Zero-crossing detector suppresses transients. Nairn & Thalimer.....	Oct.	129

Error analysis

Finding error coefficients from poles and zeros. T. J. Kobylarz.....	Mar.	89
Practical optimizing systems. J. M. Nightingale.....	Dec.	76
Sources of errors in ac servos. J. B. Heavyside.....	Feb.	85

F

Feedforward control

Feedforward analog computer control of a superfractionator. MacMullan & Shinsky.....	Mar.	69
--	------	----

Flow, fluid

Dual-range metering prevents overload on low range. E. O. Grafe.....	Mar.	117
--	------	-----

Fluid amplifiers

All-gas control directs rockets. Campagnuolo & Sieracki.....	Oct.	127
Fluid amp units flow at Honeywell (WN).....	Oct.	28
Fluid amplifiers—capabilities and applications. Gray & Stern.....	Feb.	57
How to use turbulence amplifiers for control logic. R. N. Auger.....	June	89
Perspective on fluid amplifiers—report E. J. Kompass.....	Sept.	73
The development of basic devices and the need for theory. Fox & Wood.....	Sept.	75
Practical control system components. E. J. Kompass.....	Sept.	82
Connecting elements into circuits and systems. Shinn & Boothe.....	Sept.	86
Applications in control systems.....	Sept.	94
Diverting valves cool burners. Mam-zic & Johnson.....	Sept.	94
Pure fluid controls for ship's boiler. Dexter & Colston.....	Sept.	96
Fluid logic fills bottles fast. R. N. Auger.....	Sept.	98
Vortex senses aircraft pitch rate. J. H. Lindahl.....	Sept.	99
Russians push fluid controls (WN).....	May	27

Foreign control

Automatic garages slated in France (WN).....	Sept.	172
Britishers churn out ideas at physical society show (WN).....	Mar.	32
Britons debate "automation" (WN).....	Feb.	29
Computer will even ore mix (WN).....	Sept.	32
Control computers boom in Britain (WN).....	June	30
DDC looms large in London (WN).....	July	28
Europe starts countdown on space program including controls studies (WN).....	Apr.	30
Ferranti Ltd. bridges NC user gap (WN).....	Apr.	32
French control show: MESUCORA emphasizes systems (WN).....	Jan.	31
In Europe: East Show, West Show. Derek Barlow.....	Sept.	102
Instrument sales to Europe soar (IP).....	Mar.	63
Japanese computer to manage steel mill (WN).....	Nov.	25
Japanese computers make steel (WN).....	Mar.	26
Japanese report—process instruments go solid state.....	Dec.	31
Letter from Kiev (WN).....	Aug.	30
New controls, new cooperation at British Air Show (WN).....	Oct.	35
Pneumatic logic set in East Germany (WN).....	Sept.	32
Russians push fluid controls (WN).....	May	27
Sweden takes to controls (WN).....	Nov.	32
U.S.S.R. starts setting up for weather computing (WN).....	Mar.	37

Frequency response

Compensating for dynamics in digital control. J. B. Slaughter.....	May	109
Computing time response of a dead-		

time process. Mack Tyner.....	Apr.	79
Determine process characteristics simply by filtering plant data. P.M.E.M. van der Grinten.....	July	61
Find phase shift rapidly. H. J. Szot.....	Dec.	73
Testing for plant transfer functions in presence of noise and nonlinearity. Tore Hennig.....		
III Estimating nonlinear response.....	Mar.	95
Transfer functions from frequency response. N. G. Meadows.....	June	95
Use tuned heads for spectrum analysis. Douce & Parr.....	Aug.	63

G

Graphic analysis

Compensating for dynamics in digital control. J. B. Slaughter.....	May	109
Computing time response of a dead-time process. Mack Tyner.....	Apr.	79
Converting speed-torque curves graphically. J. Miro.....	July	69
Designing servocompensators graphically. L. Q. Pena.....	Jan.	79
Find phase shift rapidly. H. J. Szot.....	Dec.	73
Fluid amplifiers—connecting elements into circuits and systems. Shinn & Boothe.....	Sept.	86
How to check linear systems stability. G. H. Hoffman I. Solving the characteristic equation.....	Aug.	75

Guidance

Gemini data: all channels lead to Houston (WN).....	July	21
Inertial navigation goes commercial (WN).....	Aug.	26
Land navigation tests of laser velocity meter set (WN).....	Sept.	27
Simple control directs free-flight rockets. Kerner & Doerr.....	Jan.	99

Gyros

The dynamically tuned free rotor gyro. Howe & Savet.....	June	67
The electric vacuum gyro—pinpoint for Polaris launching. H. W. Knoebel.....	Feb.	70
Simple control directs free-flight rockets. Kerner & Doerr.....	Jan.	99

I

Industrial control

Adding statistics to measurement. H. Locher.....	Apr.	88
Eddy currents sort steel bars. T. W. Judd.....	Nov.	111
Feedback stiffens air bearings. Wunch & Scoles.....	Apr.	99
5 uses for Hall transducers. G. W. Heumann.....		
1. Digital speed sensor.....	Jan.	57
2. Automatic conveyor dispatching.....	Jan.	58
3. Motor air-gap flux control.....	Jan.	59
4. Elevator leveling control.....	Jan.	59
5. Pneumatic-tube conveyor control.....	Jan.	60
Fluid amplifiers—fluid logic fills bottles fast. R. N. Auger.....	Sept.	98
Hall multipliers balance crankshafts. N. C. Sethne.....	Sept.	117
How to use silicon controlled rectifiers in series or parallel. A. R. Mulica.....	May	95
Linear ramp prevents weld pinholes. J. Grist.....	July	91
A milestone in adaptive machine control. Centner & Idelsohn.....	Nov.	92
Numerical control knits tailored clothes. M. Browning.....	May	101
On-the-line balancing of rotating machines. J. V. Vegte.....	Mar.	91
Optical filters sort fresh produce. Virgil Harris.....	June	114

Programmed forging press features thickness controller. Charles Finkl	Feb.	101
Putting analog control computers to work. F. M. Ryan	Aug.	53
SCR's control tapped autotransformer. Chiesa & Toso	Jan.	84
17 ways to track the edge. S. L. Sorsen	May	77
Thermistor bridge reveals defective vacuum bottles. Schumann & Ross	Feb.	103
21 ways to pick data off moving objects. R. J. Barber Part II	Jan.	61

Industry's pulse

Adjustable ac drives find first market: static inverters vary frequency	Aug.	45
CtE survey finds wide use, less at-home design: among control users it's suppliers two-to-one	June	59
Controls to dominate growth through '80's	Sept.	67
Data communications: computer men see boom ahead	Jan.	51
Digital data loggers hold their own	Apr.	51
Diversification studies get serious	July	43
The facts of life in systems engineering: do process users know the score?	Feb.	49
Instrument sales to Europe soar	Mar.	63
NC sales study finds curve steep	Oct.	61
Purse strings loosen for '64: business spending plans surveyed	May	71
Traffic control official exhorts: study now, buy later	Nov.	63

Information systems

Bionics: control engineering comes to life. R. L. Aronson	Nov.	95
Character readers for mail sorting pushed by Post Office (WN)	Feb.	19
Computer equipment comparison series 16. Card, punched tape, and printing devices for 16 new computers	Mar.	103
17. Magnetic tape and random access devices for 16 more medium to large computers	May	115
18. Processors and combined function times for 16 more medium to large computers	July	77
Control techniques revitalize railroads. D. H. Barlow	Mar.	84
Daily life at a data center (WN)	Apr.	20
Expanding internal memory in a real-time system. R. B. Scott	Oct.	118
Gemini data: all channels lead to Houston (WN)	July	21
How to price communications circuits. J. F. Holmes	Aug.	84
Linking on-line data acquisition to general purpose computers. Mitchell Bain	Apr.	92
Multiple computer system controls manufacturing line. E. E. Sarafin	Dec.	83
Papermill computer keeps the books. F. M. Ryan	Oct.	110
Programming languages ease digital simulation. D. E. Freeman	Nov.	103
7 configurations for real-time computer systems. R. V. Head	June	104
Transaction-oriented information handling systems. D. B. Thompson		
I. Information flow in the industrial enterprise	Jan.	87
II. Interfaces between work activities and the system	Feb.	91
III. Information storage	July	73
IV. Processing	Aug.	89
21 ways to pick data off moving objects. R. J. Barber Part II	Jan.	61
Warehouse computer links order picking with invoicing. Philips & Rowland	Mar.	101

Instrumentation

Accurate resetting of dry reed proximity		
--	--	--

switch. G. W. Heumann	Feb.	104
CRT displays metals' defects. Albert Kovacs	Aug.	95
Checklist for analyzer sampling systems. American Petroleum Institute	Dec.	59
Differential encoder tells position and direction. D. H. Hartke	Mar.	119
Dual-range metering prevents overload on low range. E. O. Grafe	Mar.	117
Feedback stiffens air bearings. Wunch & Scoles	Apr.	99
Feedback stiffens D'Arsonval movement. Ray Bergeson	Sept.	121
Header in bundled tubing eases pneumatics installation. Dibbern & Robinson	Jan.	103
Instrument sales to Europe soar (IP)	Mar.	63
Intrinsic safety. F. M. Ryan	June	73
Large facility checks out rocket booster injector valves. R. D. Witter	June	111
Measuring 100 pressures in 15 seconds. R. H. Cerni	July	89
Microwaves analyze gas composition. G. Johansson	Apr.	101
Miniature tape recorders. E. D. Lucas	Dec.	53
Multistream distillation monitors. W. H. Topham	Apr.	65
Ratio pyrometer ignores surface variations. G. K. Caulton	Nov.	111
17 ways to track the edge. S. L. Sorsen	May	77
Toothed wheels measure torque. Sid Van Manen	Mar.	117
Zeroing in on direct digital control. H. R. Karp	May	105

Integrated circuits (see Solid state devices)

L

Light (see Optical systems)

Logic

How to use turbulence amplifiers for control logic. R. N. Auger	June	89
NOR/NAND logic the easy way. C. F. Hill	May	81
Truth table logic speeds BCD-binary conversions. David Cohen	Mar.	78
Try permutation codes. F. H. Fowler Jr.	Jan.	75

M

Machine control

Adjustable ac drives find first market: static inverters vary frequency (IP)	Aug.	45
The coordinate concept: an approach to tape punching. D. B. Holland & others	Aug.	60
Differential encoder tells position and direction. D. H. Hartke	Mar.	119
Digital linear interpolation and the binary rate multiplier. W. Arnstein & others	June	79
Feedback stiffens air bearings. Wunch & Scoles	Apr.	99
5 uses for Hall transducers. G. W. Heumann:		
1. Digital speed sensor	Jan.	57
2. Automatic conveyor dispatching	Jan.	58
3. Motor air-gap flux control	Jan.	59
4. Elevator leveling control	Jan.	59
5. Pneumatic-tube conveyor control	Jan.	60
How to use silicon controlled rectifiers in series or parallel. A. R. Mulica	May	95
Linear ramp prevents weld pinholes. J. Grist	July	91
A milestone in adaptive machine control. Centner & Idelson	Nov.	92
NC sales study finds curve still steep (IP)	Oct.	61
Numerical control knits tailored clothes. M. Browning	May	101

Numerical Control Society First Annual Meeting and Technical Conference—users demand more NC education (WN)	May	23
Numerically controlled miller optimizes own production. Robert Sem	Aug.	93
On-the-line balancing of rotating machines. J. V. Vegte	Mar.	91
Programmed forging press features thickness controller. Charles Finkl	Feb.	101
Sensors will optimize metal cutting, experimenters hope (WN)	Aug.	19
Simple computer and crt display expedite typesetting. G. Y. Chu	Apr.	97

Man-machine systems

Transaction-oriented information handling systems. D. B. Thompson		
I. Information flow in the industrial enterprise	Jan.	87
II. Interfaces between work activities and the system	Feb.	91

Management by computer (see also Information systems)

Control techniques revitalize railroads. D. H. Barlow	Mar.	84
Multiple computer system controls manufacturing line. E. E. Sarafin	Dec.	83
Papermill computer keeps the books. F. M. Ryan	Oct.	110

Marketing

Adjustable ac drives find first market: static inverters vary frequency (IP)	Aug.	45
Louis Allis emerges as a drive systems maker (WN)	Dec.	32
CtE survey finds wide use, less at-home design: among control users it's suppliers two-to-one (IP)	June	59
Controls to dominate growth through '80's (IP)	Sept.	67
Data communications: computer men see boom ahead (IP)	Jan.	51
Defense industry cuts trigger more diversity talk (WN)	Oct.	26
Digital data loggers hold their own (IP)	Apr.	51
Diversification studies get serious (IP)	July	43
The facts of life in systems engineering: do process users know the score? (IP)	Feb.	49
Instrument sales to Europe soar (IP)	Mar.	63
NC sales study finds curve still steep (IP)	Oct.	61
Process control sales put at \$330 million this year (WN)	July	30
Purse strings loosen for '64: business spending plans surveyed (IP)	May	71
Traffic control official exhorts: study now, buy later (IP)	Nov.	63

Materials handling

Character readers for mail sorting pushed by Post Office (WN)	Feb.	19
Sampling controllers pace Japanese sintering mill. Kazuto Togino	May	86
17 ways to track the edge. S. L. Sorsen	May	77

Mathematical analysis (see also Graphic analysis)

Controller settings and loop performance. P. S. Buckley	Aug.	81
Determine process characteristics simply by filtering plant data. P.M.E.M. van der Grinten	July	61
Finding error coefficients from poles and zeros. T. J. Kobylarz	Mar.	89
Finding quintic-equation roots. C. R. Seliger	May	107
How to check systems stability. C. H. Hoffman I. Solving the characteristic equation	Aug.	75
Practical optimizing systems. J. M. Nightingale	Dec.	76

10 ways to find the optimum. J. M. Idelsohn	June	97
Transfer functions from frequency response. N. G. Meadows	June	95

Measuring

Adding statistics to measurement. H. Locher	Apr.	88
Differential encoder tells position and direction. D. H. Hartke	Mar.	119
Finding synchro position from voltages. B. R. Robinson	Oct.	107
Help for the stranded motorist. Bacon & Cosgriff	Apr.	99
How papermakers measure moisture. E. F. Thode	Nov.	67
Laser measures length to a hundred-thousandth (WN)	Oct.	28
Measuring 100 pressures in 15 seconds. R. H. Cerni	July	89
Programmed forging press features thickness controller. Charles Finkl	Feb.	101
Ratio pyrometer ignores surface variations. G. K. Caulton	Nov.	111
Thermistor bridge reveals defective vacuum bottles. Schumann & Ross	Feb.	103
Toothed wheels measure torque. Sid Van Manen	Mar.	117

Meetings, news reports

Britishers churn out ideas at physical society show (WN)	Mar.	32
FJCC: control needs affect computer designs (WN)	Dec.	24
FJCC reports: eight new computers bow (WN)	Jan.	26
French control show: MESUCORA emphasizes systems (WN)	Jan.	31
IEEE—Defense industry cuts trigger more diversity talk (WN)	Oct.	26
IFAC process computer talks take DDC in stride	Dec.	21
ISA—Direct digital control gets user go-ahead (WN)	June	23
ISA Analytical Instrument Div. Symposium-makers and users joust over analytical instruments (WN)	July	23
ISA Show 1964: much DDC talk, little new hardware (WN)	Nov.	22
In Europe: East Show, West Show. Derek Barlow	Sept.	102
Instrument, Electronics and Automation Exhibition—DDC looms large in London (WN)	July	28
JACC 1964: largest yet, best program balance (WN)	Aug.	22
Numerical Control Society First Annual Meeting and Technical Conference—Users demand more NC education (WN)	May	23
SJCC: hybrids—computers start holding hands (WN)	June	27
Systems Engineering Exposition—High-level audience, "World's Fair" lectures (WN)	July	24
TAPPI 19th Engineering Conference—controls loom large (WN)	Sept.	22
Traffic men talk controls (WN)	Oct.	27

Memories

Expanding internal memory in a real-time system. R. B. Scott	Oct.	118
Mold memories on mesh (WN)	Mar.	28

Metals processing and finishing

Eddy currents sort steel bars. T. W. Judd	Nov.	111
Japanese computers make steel	Mar.	26
Sampling controllers pace Japanese sintering mill. Kazuto Togino	May	86
Simple computer cuts billets five ways. J. P. Clyne	Feb.	81
Steel controls emerge (WN)	Feb.	23

Meters

Feedback stiffens D'Arsonval movement.		
--	--	--

Ray Bergeson	Sept.	121
--------------	-------	-----

Microcircuits (see Solid state devices)

Mining and ore processing

Computer will even ore mix (WN)	Sept.	32
Sampling controllers pace Japanese sintering mill. Kazuto Togino	May	86

Missiles

All-gas control directs rockets. Campagnuolo & Sieracki	Oct.	127
The dynamically tuned free rotor gyro. Howe & Savet	June	67
The electric vacuum gyro—pinpoint for Polaris launching. H. W. Knoebel	Feb.	70
Simple control directs free-flight rockets. Kerner & Doerr	Jan.	99

Motors, electrical (see Actuators)

Multipliers

Digital linear interpolation and the binary rate multiplier. W. Arnstein & others	June	79
Hall multipliers balance crankshafts. N. C. Sethne	Sept.	117

N

Navigation (see Guidance)

Nonlinear systems

Testing for plant transfer functions in presence of noise and nonlinearity. Tore Hennig		
III Estimating nonlinear response	Mar.	95

Numerical control (see Machine control)

O

Optical systems

Designer's guide to solid state photo-sensors. J. R. McDermott	Oct.	71
Optical comb filters classify vehicles. J. E. Zupanick	Dec.	97
Optical filters sort fresh produce. Virgil Harris	June	114

Optimizing control

A milestone in adaptive machine control. Centner & Idelsohn	Nov.	92
Numerically controlled miller optimizes own production. Robert Sem	Aug.	93
Practical optimizing systems. J. M. Nightingale	Dec.	76
Sensors will optimize metal cutting, experimenters hope (WN)	Aug.	19
10 ways to find the optimum. J. M. Idelsohn	June	97

P

Paper making

Controls loom large at pulp and paper meeting (WN)	Sept.	22
Do control computers look good on paper? (WN)	May	18
How papermakers measure moisture. E. F. Thode	Nov.	67
Papermill computer keeps the books. F. M. Ryan	Oct.	110
Profiler tests burst strength. W. T. Dyer	Oct.	130

Personality sketches

Carlberg, Edward F.	Mar.	17
Crawford, William A.	Oct.	21
Dow, Mike	Aug.	15
Gille, Jean-Charles	July	15
Hoyt, Paul	Feb.	15
Mikelson, Walter	Nov.	19
Nightingale, James M.	Dec.	17
Ovshinsky, Stanford R.	Apr.	17
Stout, Thomas M.	June	19
Thompson, Donald B.	Jan.	17
VickRoy, Thomas R.	May	15
Warren, Raymond W.	Sept.	15

Pneumatics (see also Fluid amplifiers)

Header in bundled tubing eases pneumatics installation. Dibbern & Robinson	Jan.	103
Making pneumatic regulators stable: drill a capillary. T. P. Carey	Feb.	87
Pneumatic logic set in East Germany (WN)	Sept.	32

Power plant control

Startup at Riverside. E. J. Kompass	Jan.	69
-------------------------------------	------	----

Power supplies

Dual power supplies boost computer reliability. C. J. Armour	Jan.	103
Emergency power supplies. M. F. Brown	Jan.	65
SCR's control tapped autotransformer. Chiesa & Toso	Jan.	84

Process control

Adding statistics to measurement. H. Locher	Apr.	88
Checklist for analyzer sampling systems. American Petroleum Institute	Dec.	59
Computing time response of a dead-time process. Mack Tyner	Apr.	79
Control computers boom in Britain (WN)	June	30
Controller settings and loop performance. P. S. Buckley	Aug.	81
Controls loom large at pulp and paper meeting (WN)	Sept.	22
Converting process equations for analog computer control. George Platt	Feb.	65
Cutting controller costs. Ida & St. Clair	Oct.	86
DDC looms large in London (WN)	July	28
Determine process characteristics simply by filtering plant data. P. M. E. M. van der Grinten	July	61
Direct digital control continues to pulse (WN)	Apr.	25
Direct digital control gets user go-ahead (WN)	June	23
Do control computers look good on paper? (WN)	May	18
Drum and scope unit plots plant variables. John Werme	Nov.	109
Dual-range metering prevents overload on low range. E. O. Grafe	Mar.	117
Emergency power supplies. M. F. Brown	Jan.	65
The facts of life in systems engineering: do process users know the score? (IP)	Feb.	49
Feedforward analog computer control of a superfractionator. MacMullan & Shinsky	Mar.	69
How papermakers measure moisture. E. F. Thode	Nov.	67
IFAC process computer talks take DDC in stride (WN)	Dec.	21
Intrinsic safety. F. M. Ryan	June	73
Magnetic sensor tells valve's position. D. L. MacDavid	Nov.	114
Makers and users joust over analytical instruments (WN)	July	23
Making pneumatic regulators stable: drill a capillary. T. P. Carey	Feb.	87
Merchant marine pipes controls aboard (WN)	Mar.	20
Microwaves analyze gas composition. G. Johansson	Apr.	101
Multiple computer system controls manufacturing line. E. E. Sarafin	Dec.	83
Multistream distillation monitors. W. H. Topham	Apr.	65
Operators run simulated refinery for pre-startup experience. R. E. Lieber	Sept.	105
Papermill computer keeps the books. F. M. Ryan	Oct.	110
Phillips tries DDA computer for distillation columns control. M. L. Johnson & others	Aug.	68

Practical optimizing systems. J. M. Nightingale	Dec.	76
Putting analog control computers to work. F. M. Ryan	Aug.	53
Sampling controllers pace Japanese sintering mill. Kazuto Togino	May	86
Startup at Riverside. E. J. Kompass	Jan.	69
Stream analyzer senses crystallization	Sept.	119
Testing for plant transfer functions in presence of noise and nonlinearity. Tore Hennig	Mar.	95
III Estimating nonlinear response	May	105

Production control (see also Information systems)

Multiple computer system controls manufacturing line. E. E. Sarafin	Dec.	83
Transaction-oriented information handling systems. D. B. Thompson	Jan.	87
I. Information flow in the industrial enterprise	Feb.	91
II. Interfaces between work activities and the system	July	73
III. Information storage	Aug.	89

Programmed systems

Numerical control knits tailored clothes. M. Browning	May	101
Programmed forging press features thickness controller. Charles Finkl	Feb.	101

R

Recording (see also Tape recording)

Drum and scope unit plots plant variables. John Werme	Nov.	109
---	------	-----

Relays

Accurate resetting of dry reed proximity switch. G. W. Heumann	Feb.	104
--	------	-----

Reliability

Dual power supplies boost computer reliability. C. J. Armour	Jan.	103
How to use silicon controlled rectifiers in series or parallel. A. R. Mulica	May	95

Russian control

In Europe: East Show, West Show. Derek Barlow	Sept.	102
Letter from Kiev (WN)	Aug.	30
Russians push fluid control (WN)	May	27
U.S.S.R. starts setting up for weather computing (WN)	Mar.	37

S

Safety

Help for the stranded motorist. Bacon & Cosgriff	Apr.	99
Intrinsic safety. F. M. Ryan	June	73
17 ways to stop control accidents. Seminara & Parsons	Nov.	84
Warning system shortens traffic delay at railroad crossings. C. M. Steele	June	113

Sampled-data systems

Compensating for dynamics in digital control. J. B. Slaughter	May	109
Sampling controllers pace Japanese sintering mill. Kazuto Togino	May	86

Self organizing systems

Bionics: control engineering comes to life. R. L. Aronson	Nov.	95
---	------	----

Sensors (see Transducers)

Servomechanisms

Choppers compensate ac servos. E. R.		
--------------------------------------	--	--

Schlesinger	Sept.	113
Cogging in slow-speed servos	July	59
Designer's workbook. A. F. Clarke, Jr. 1. Selecting ac servomotor compensation	Oct.	99
On-the-line balancing of rotating machines. J. V. Vegte	Mar.	91
Sources of errors in ac servos. J. B. Heaviside	Feb.	85
Testing OGO's attitude controls. N. H. Beachley & others	Oct.	93

Servovalves (see Valves)

Simulation

Converting process equations for analog computer control. George Platt	Feb.	65
Mechanized contour display helps lay ocean pipeline. R. M. Gitlin	May	125
Operators run simulated refinery for pre-startup experience. R. E. Lieber	Sept.	105
Programming languages ease digital simulation. D. E. Freeman	Nov.	103
Testing OGO's attitude controls. N. H. Beachley & others	Oct.	93

Solid state devices

Bidirectional static switch simplifies ac control. M. P. Southworth	Mar.	75
Designer's guide to solid state photo-sensors. J. R. McDermott	Oct.	71
Economy microcircuits from off-MIL-spec yield (WN)	June	26
5 uses for Hall transducers. G. W. Heumann	Jan.	57
How to use silicon controlled rectifiers in series or parallel. A. R. Mulica	May	95
Integrated circuits—prices down, speeds up; civilian uses appear (WN)	Feb.	24
SCR's control tapped autotransformer. Chiesa & Toso	Jan.	84
Static ac adjustable frequency drives K. A. Hultstrand	Apr.	57
The threshold switch: new component for ac control. M. P. Southworth	Apr.	69

Space vehicle control

The dynamically tuned free rotor gyro. Howe & Savet	June	67
The electric vacuum gyro—pinpoint for Polaris launching. H. W. Knoebel	Feb.	70
Europe starts countdown on space program including controls studies (WN)	Apr.	30
Gemini data: all channels lead to Houston (WN)	July	21
Hand control signals six degrees of freedom. R. M. Johnson	Sept.	121
Simple control directs free-flight rockets. Kemer & Doerr	Jan.	99
Testing OGO's attitude controls. N. H. Beachley & others	Oct.	93

Speed-control

Adjustable ac drives find first market: static inverters vary frequency (IP)	Aug.	45
Cogging in slow-speed servos	July	59
Converting speed-torque curves graphically. J. Miro	July	69
Static ac adjustable frequency drives. K. A. Hultstrand	Apr.	57
Two-in-one drive creeps smoothly. G. W. Heumann	July	93
Variable ac drive to get traction tryout (WN)	July	24

Standards

What's new in control standards. H. L. Mason	June	85
--	------	----

Statistical techniques

Adding statistics to measurement. H. Locher	Apr.	88
Use tuned heads for spectrum analysis.		

Douce & Parr	Aug.	63
--------------------	------	----

Switching techniques

The threshold switch: new component for ac control. M. P. Southworth	Apr.	69
Time division multiplexing simplifies voice-reply switching. H. A. Kampf	Jan.	101

Synchronizing

Check unit synchronizes alternators. D. C. Gilchrist	Oct.	130
--	------	-----

Systems

Analysis		
Determine process characteristics simply by filtering plant data. P. M. E.M. van der Grinten	July	61
Finding error coefficients from poles and zeros. T. J. Kobylarz	Mar.	89
How to check linear systems stability. C. H. Hoffman I. Solving the characteristic equation	Aug.	75
Phillips tries DDA computer for distillation columns control. M. L. Johnson & others	Aug.	68
Sources of errors in ac servos. J. B. Heaviside	Feb.	85
10 ways to find the optimum. J. M. Idelsohn	June	97
Testing for plant transfer functions in presence of noise and nonlinearity. Tore Hennig	Mar.	95
III Estimating nonlinear response	June	95
Transfer functions from frequency response. N. G. Meadows	June	95
Use tuned heads for spectrum analysis. Douce & Parr	Aug.	63

Design

Designer's Workbook		
1. Selecting ac servomotor compensation. A. F. Clarke Jr.	Oct.	99
2. Putting dc torque motors to work. G. T. Ganczarski	Nov.	75
Designing servocompensators graphically. L. Q. Pena	Jan.	79
Fluid amplifiers—capabilities and applications. Gray & Stern	Feb.	57
Fluid amplifiers—connecting elements into circuits and systems. Shinn & Boothe	Sept.	86
How to design low-cost digital controls. R. M. Centner	Feb.	75
Practical optimizing systems. J. M. Nightingale	Dec.	76
17 ways to stop control accidents. Seminara & Parsons	Nov.	84

Engineering

4 views of train control—San Francisco tries them all. B. M. Blake	Dec.	62
Multiple computer system controls manufacturing line. E. E. Sarafin	Dec.	83
Phillips tries DDA computer for distillation columns control. M. L. Johnson & others	Aug.	68

Specifications

Checklist for analyzer sampling systems. American Petroleum Institute	Dec.	59
---	------	----

T

Tape recording and reading (see also Information systems)

Magnetic		
Computer equipment comparison series 17. Magnetic tape and random access devices for 16 more medium to large computers	May	115
Incremental magnetic tape recorders		
I. Available stepping recorders and where they apply. R. A. Curtis Jr.	July	51
II. Stepping techniques for compu-		

ter compatible tapes. J. T. Boag July 54	Testing OGO's attitude controls. N. H. Beachley & others.....Oct. 93	Transportation
Miniature tape recorders. E. D. Lucas Dec. 53	Testing toward the moon. E. J. Kom- pass.....Apr. 74	Computer will even ore mix (WN) Sept. 32
Use tuned heads for spectrum analy- sis. Douce & Parr.....Aug. 63	Three-axis fluxgate controls magnetic environment. Norman Wolff.....May 127	Control techniques revitalize railroads. D. H. Barlow.....Mar. 84
Punching		4 views of train control—San Francisco tries them all. B. M. Blake.....Dec. 62
The coordinate concept: an approach to tape punching. D. B. Holland & others.....Aug. 60	Training	Merchant marine pipes controls aboard (WN).....Mar. 20
Portable tape recorder speeds data gathering. Will Rogers.....Feb. 104	Operators run simulated refinery for prestartup experience. R. E. Lieber Sept. 105	Optical comb filters classify vehicles. J. E. Zupanick.....Dec. 97
Temperature	Transducers	Remote control networks keep pilots in touch. R. J. Glischinski.....Mar. 115
Multiple thermistors monitor car com- fort. Nicholas Hunter.....May 125	Balanced beam improves angular ac- celerometer. Phillips & Roberson July 91	Traffic men talk controls (WN).....Oct. 27
Ratio pyrometer ignores surface varia- tions. G. K. Caulton.....Nov. 111	Designer's guide to solid state photo- sensors. J. R. McDermott.....Oct. 71	Trucks brake safely with simple valves. H. J. Kerr.....Dec. 100
Terminology	5 uses for Hall transducers. G. W. Heu- mann.....Jan. 57	Variable ac drive to get traction tryout (WN).....July 24
What's new in control standards. H. L. Mason.....June 85	1. Digital speed sensor.....Jan. 57	Warning system shortens traffic delay at railroad crossings. C. M. Steele June 113
Testing	2. Automatic conveyor dispatching Jan. 58	Tubes
Determine process characteristics simply by filtering plant data. P. M. E. M. van der Grinten.....July 61	3. Motor air-gap flux control.....Jan. 59	Header in bundled tubing eases pneu- matics installation. Dibbern & Robin- son.....Jan. 103
Feedback loops control "sun". Benning & Castle.....Aug. 97	4. Elevator leveling control.....Jan. 59	
Large facility checks out rocket booster injector valves. R. D. Witter.....June 111	5. Pneumatic-tube conveyor control Jan. 60	U
Profiler tests burst strength. W. T. Dyer.....Oct. 130	Fluid amplifiers—practical control sys- tem components. E. J. Kompass Sept. 82	Utilities (see Power plant control)
Special jig computes areas. H. E. Hoteko Aug. 97	Fluid amplifiers—vortex senses aircraft pitch rate. J. H. Lindahl.....Sept. 99	V
Testing for plant transfer functions in presence of noise and nonlinearity. Tore Hennig III Estimating nonlinear response Mar. 95	Magnetic sensor tells valve's position. D. L. MacDavid.....Nov. 114	Valves
	Oleo transducers compute plane's weight. B. J. Hawkins.....Dec. 99	Fluid amplifiers—diverting valves cool burners. Mamzic & Johnson.....Sept. 94
	Toothed wheels measure torque. Sid Van Manen.....Mar. 117	Large facility checks out rocket booster injector valves. R. D. Witter.....June 111
		Trucks brake safely with simple valves. H. J. Kerr.....Dec. 100

AUTHORS INDEX

American Petroleum Institute, Committee on Refinery Equipment. Checklist for analyzer sampling systems.....Dec. 59	Buckley, Page S. Controller settings and loop performance.....Aug. 81	pneumatics installation.....Jan. 103
Armour, C. J. Dual power supplies boost computer reliability.....Jan. 103	Campagnuolo, J. & L. M. Sieracki. All- gas control directs rockets.....Oct. 127	Doerr, F. & V. Kerner. Simple control directs free-flight rockets.....Jan. 99
Armstein, W. & others. Digital linear in- terpolation and the binary rate multi- plier.....June 79	Carey, Thomas P. Making pneumatic reg- ulators stable: drill a capillary.....Feb. 87	Douce, J. L. & P. J. Parr. Use tuned heads for spectrum analysis.....Aug. 63
Aronson, R. L. Bionics: control engineer- ing comes to life.....Nov. 95	Castle, J. A. & F. N. Benning. Feedback loops control "sun".....Aug. 97	Dyer, W. T. Profiler tests burst strength Oct. 130
Auger, Raymond N. Fluid amplifiers— fluid logic fills bottles fast.....Sept. 98	Caulton, G. K. Ratio pyrometer ignores surface variations.....Nov. 111	Farnsworth, R. G. Counting pulses on parallel channels.....July 65
How to use turbulence amplifiers for control logic.....June 89	Centner, Ronald M. How to design low- cost digital controls.....Feb. 75	Feldman, A. & others. The coordinate concept: an approach to tape punch- ing.....Aug. 60
Bacon, J. & R. L. Cosgriff. Help for the stranded motorist.....Apr. 99	Centner, R. M. & J. M. Idelsohn. A milestone in adaptive machine con- trol.....Nov. 92	Finkel, Charles. Programmed forging press features digital thickness controller Feb. 101
Bain, Mitchell. Linking on-line data ac- quisition to general purpose comput- ers.....Apr. 92	Cerni, Richard H. Measuring 100 pres- sures in 15 seconds.....July 89	Fowler, Franklin H. Jr. Inverse table lookup for ordinal transformations Nov. 101
Barber, Robert J. 21 ways to pick data off moving objects Part II.....Jan. 61	Chestnut, Harold. Control gap: is it a vector? (guest editorial).....Feb. 53	Try permutation codes.....Jan. 75
Barlow, Derek H. Control techniques re- vitalize railroads.....Mar. 84	Chiesa, E. & P. Toso. SCR's control tapped autotransformer.....Jan. 84	Fox, H. L. & O. Lew Wood. Fluid am- plifiers—the development of basic de- vices and the need for theory.....Sept. 75
In Europe: East Show, West Show Sept. 102	Chu, C. Y. Simple computer and crt display expedite typesetting.....Apr. 97	Freeman, Donald E. Programming lan- guages ease digital simulation.....Nov. 103
Beachley, N. H. & others. Testing OGO's attitude controls.....Oct. 93	Clarke, Arthur F., Jr. Designer's work- book 1. Selecting ac servomotor compensation.....Oct. 99	Ganczarski, George J. Designer's Work- book 2. Putting dc torque motors to work.....Nov. 75
Becker, S. M. Try signal flow graphs for analog programming.....Sept. 109	Clyne, J. P. Simple computer cuts billets five ways.....Feb. 81	Gilchrist, D. C. Check unit synchronizes alternators.....Oct. 130
Benning, F. N. & J. A. Castle. Feedback loops control "sun".....Aug. 97	Cohen, David. Truth table logic speeds BCD-binary conversions.....Mar. 78	Gitlin, R. M. Mechanized contour dis- play helps lay ocean pipeline.....May 125
Bergeson, Ray. Feedback stiffens D'Ar- sonval movement.....Sept. 121	Colston, J. R. & E. M. Dexter. Fluid am- plifiers—pure fluid controls for ship's boiler.....Sept. 96	Glischinski, R. J. Remote control net- works keep airline pilots in touch Mar. 115
Blake, Bond M. 4 views of train control —San Francisco tries them all.....Dec. 62	Cosgriff, R. L. & J. Bacon. Help for the stranded motorist.....Apr. 99	Grafe, E. O. Dual-range metering system prevents overload on low range Mar. 117
Boag, James T. Stepping techniques for computer compatible tapes.....July 54	Cresap, McCormick and Paget. Comput- er equipment comparison series.....	Gray, W. E. & Hans Stern. Fluid am- plifiers—capabilities and applications Feb. 57
Boothe, W. A. & J. N. Shinn. Fluid amplifiers—connecting elements into circuits and systems.....Sept. 86	Curtis, Roger A. Jr. Available stepping recorders and where they apply.....July 51	Grist, J. Linear ramp prevents weld pin- holes.....July 91
Brown, Merle F. Emergency power sup- plies.....Jan. 65	Dexter, E. M. & J. R. Colston. Fluid amplifiers—pure fluid controls for ship's boiler.....Sept. 96	Harris, Virgil. Optical filters sort fresh
Browning, M. Numerical control knits tailored clothes.....May 101	Dibbern, J. C. & L. W. Robinson. Header in bundled tubing eases	

produce	June 114	MacDavid, Daniel L. Magnetic sensor tells valve's position.....	Nov. 114	ac servos	Sept. 113
Hartke, David H. Differential encoder tells position and direction....	Mar. 119	MacMullan, E. C. & F. G. Shinsky. Feedforward analog computer control of a superfractionator.....	Mar. 69	Schumann, F. & B. Ross. Thermistor bridge reveals defective vacuum bottles	Feb. 103
Hawkins, Barry J. Oleo transducers compute plane's weight.....	Dec. 99	Mamzic, C. L. & B. L. Johnson. Fluid amplifiers—diverting valves cool burners	Sept. 94	Scoles, C. A. & H. L. Wunch. Feed-back stiffens air bearings.....	Apr. 99
Head, Robert B. 7 configurations for real-time computer systems.....	June 104	Martin, L. B. & others. Testing OGO's attitude controls	Oct. 93	Scott, Richard B. Expanding internal memory in a real-time system.....	Oct. 118
Heaviside, J. B. Sources of errors in ac servos	Feb. 85	Mason, H. L. What's new in control standards	June 85	Seliger, Charles R. Finding quintic-equation roots	May 107
Hennig, Tore. Testing for plant transfer functions in presence of noise and nonlinearity.		McDermott, J. R. Control designer's guide to solid state photosensors	Oct. 71	Sem, Robert. Numerically controlled miller optimizes own production.	Aug. 93
III Estimating nonlinear response	Mar. 95	Meadows, N. G. Transfer functions from frequency response	June 95	Seminara, J. L. & S. O. Parsons. 17 ways to stop control accidents.....	Nov. 84
Heumann, Gerhart W. Accurate resetting of dry reed proximity switch	Feb. 104	Mergler, H. W. & others. Digital linear interpolation and the binary rate multiplier	June 79	Sethne, Norman C. Hall multipliers balance cranks shafts	Sept. 117
5 uses for Hall transducers.....	Jan. 57	Miro, J. Converting speed-torque curves graphically	July 69	Shinn, J. N. & W. A. Boothe. Fluid amplifiers—connecting elements into circuits and systems.....	Sept. 86
Two-in-one drive creeps smoothly.....	July 93	Moberly, B. R. & others. The coordinate concept: an approach to tape punching	Aug. 60	Shinsky, F. G. & E. C. MacMullan. Feedforward analog computer control of a superfractionator	Mar. 69
Hill, Charles F. NOR/NAND logic the easy way	May 81	Mulica, A. R. How to use silicon controlled rectifiers in series or parallel	May 95	Sieracki, L. M. & J. Campagnuolo. All-gas control directs rockets.....	Oct. 127
Hoffman, C. H. How to check linear systems stability. I. Solving the characteristic equation	Aug. 75	Nairn, J. L. & D. A. Thalimer. Zero-crossing detector suppresses transients	Oct. 129	Singer, B. & others. Digital linear interpolation and the binary rate multiplier	June 79
Holland, D. B. & others. The coordinate concept: an approach to tape punching	Aug. 60	Nightingale, J. M. Practical optimizing systems	Dec. 76	Slaughter, John B. Compensating for dynamics in digital control.....	May 109
Holmes, James F. How to price communications circuits	Aug. 84	O'Gorman, Vincent. The harmonic drive electromechanical actuator	Dec. 69	Sorsen, S. L. 17 ways to track the edge	May 77
Hoteko, H. E. Special jig computes areas	Aug. 97	Otten, D. D. & others. Testing OGO's attitude controls	Oct. 93	Southworth, Mason P. Bidirectional static switch simplifies ac control	Mar. 75
Howe, E. W. & P. H. Savet. The dynamically tuned free rotor gyro	June 67	Parr, P. J. & J. L. Douce. Use tuned heads for spectrum analysis	Aug. 63	The threshold switch: new component for ac control	Apr. 69
Hultstrand, K. A. Static ac adjustable frequency drives	Apr. 57	Parsons, J. R. & others. Phillips tries DDA computer	Aug. 68	Spencer, A. J. Pins and loops read out miner deployment data.....	May 123
Hunter, Nicholas. Multiple thermistors monitor car comfort.....	May 125	Parsons, S. O. & J. L. Seminara. 17 ways to stop control accidents.....	Nov. 84	Steele, Carroll M. Warning system shortens traffic delay at railroad crossings	June 113
Ida, E. S. & D. W. St. Clair. Cutting controller costs	Oct. 86	Pena, L. Q. Designing servocompensators graphically	Jan. 79	Stern, Hans & W. E. Gray. Fluid amplifiers—capabilities and applications	Feb. 57
Idelsohn, J. M. 10 ways to find the optimum	June 97	Phillips, D. K. & H. L. Roberson. Balanced beam improves angular accelerometer	July 91	Szot, Henry J. Find phase shift rapidly	Dec. 73
Idelsohn, J. M. & R. M. Centner. A milestone in adaptive machine control	Nov. 92	Philps, C. L. & L. Rowland. Warehouse computer links order picking with invoicing	Mar. 101	Thalimer, D. A. & J. L. Nairn. Zero-crossing detector suppresses transients	Oct. 129
Jacobus, D. P. & others. The coordinate concept: an approach to tape punching	Aug. 60	Pierson, D. N. & others. Phillips tries DDA computer	Aug. 68	Thode, Edward F. How papermakers measure moisture	Nov. 67
Johansson, G. Microwaves analyze gas composition	Apr. 101	Platt, George. Converting process equations for analog computer control	Feb. 65	Thompson, D. B. Transaction-oriented information handling systems	
Johnson, B. L. & C. L. Mamzic. Fluid amplifiers—diverting valves cool burners	Sept. 94	Roberson, H. L. & D. K. Phillips. Balanced beam improves angular accelerometer	July 91	I. Information flow in the industrial enterprise	Jan. 87
Johnson, M. L. & others. Phillips tries DDA computer	Aug. 68	Robinson, B. H. Finding synchro position from voltage measurements	Oct. 107	II. Interfaces between work activities and the system.....	Feb. 91
Johnson, R. M. Hand control signals six degrees of freedom	Sept. 121	Robinson, L. W. & J. C. Dibbern. Header in bundled tubing eases pneumatics installation	Jan. 103	III. Information storage.....	July 73
Judd, T. W. Eddy currents sort steel bars	Nov. 111	Rogers, Will. Portable tape recorder speeds digital data gathering.....	Feb. 104	IV. Processing	Aug. 89
Kampf, Henry A. Time division multiplexing simplifies voice-reply switching	Jan. 101	Roland, M. C. Gallium phosphide lamps code digits on film.....	June 113	Togino, Kazuto. Sampling controllers pace Japanese sintering mill.....	May 86
Karp, Harry R. Zeroing in on direct digital control	May 105	Ross, B. & F. Schumann. Thermistor bridge reveals defective vacuum bottles	Feb. 103	Topham, W. H. Multistream distillation monitors	Apr. 65
Kerner, V. & F. Doerr. Simple control directs free-flight rockets	Jan. 99	Rowland, L. & C. C. Phillips. Warehouse computer links order picking with invoicing	Mar. 101	Toso, P. & E. Chiesa. SCR's control tapped autotransformer	Jan. 84
Kerr, Howard J. Trucks brake safely with simple valves	Dec. 100	Ryan, Frank M. Intrinsic safety.....	June 73	Tyner, Mack. Computing the time response of a deadtime process.....	Apr. 79
Knoebel, Howard W. The electric vacuum gyro—pinpoint for Polaris launching	Feb. 70	Papermill computer keeps the books	Oct. 110	van der Grinten, P.M.E.M. Determine process characteristics simply by filtering plant data.....	July 61
Kobylarz, Thaddeus J. Finding error coefficients from poles and zeros	Mar. 89	Putting analog control computers to work	Aug. 53	Van Manen, Sid. Toothed wheels measure torque	Mar. 117
Kompass, E. J. Perspective on fluid amplifiers	Sept. 73	St. Clair, D. W. & E. S. Ida. Cutting controller costs	Oct. 86	Vegte, J. Vande. On-the-line balancing of rotating machines.....	Mar. 91
Startup at Riverside.....	Jan. 69	Sarafin, Eugene E. Multiple computer system controls manufacturing line	Dec. 83	Werme, John. Drum and scope unit plots plant variables.....	Nov. 109
Testing toward the moon.....	Apr. 74	Savet, P. H. & E. W. Howe. The dynamically tuned free rotor gyro	June 67	Witter, R. D. Large facility checks out rocket booster injector valves.....	June 111
Kovacs, Albert. CRT displays metals' defects	Aug. 95	Schlesinger, E. R. Choppers compensate		Wolf, Norman. Three-axis fluxgate controls magnetic environment.....	May 127
Lieber, Roy E. Operators run simulated refinery for pre-startup experience	Sept. 105			Wood, O. Lew & H. L. Fox. Fluid amplifiers—the development of basic devices and the need for theory	Sept. 75
Lindahl, J. H. Fluid amplifiers—vortex senses aircraft pitch rate.....	Sept. 99			Wunch, H. L. & C. A. Scoles. Feed-back stiffens air bearings.....	Apr. 99
Locher, H. Adding statistics to measurement	Apr. 88			Zupanick, J. E. Optical comb filters classify vehicles	Dec. 97
Lucas, E. D. Miniature tape recorders	Dec. 53				
Lupfer, D. E. & others. Phillips tries DDA computer	Aug. 68				